

## CLAIMS

Having thus described the invention, what I desire to claim and secure by letters patent is:

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A method of making a determination for a presence of a harmful water-soluble multi-valent, and ionically reducible metal contaminant in water, said method comprising:

- 10        a)    introducing into a sample of the water to be tested  
             a composite <sup>for</sup> comprising a water-soluble, multi-  
             valent, metal-containing reducing agent which will  
             reduce the metal contaminant to a lower valence  
             state;
- 15        b)    allowing for a change in said water to provide  
             indication of the presence of the potentially  
             harmful metal contaminant based on said change.

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20        The method for determining a presence of a metal contaminant  
in water of Claim 1 further characterized in that said metal  
contaminant is a contaminant which comprises a metal selected from  
the group consisting of arsenic, chromium and mercury and salts  
thereof.

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The method for determining a presence of a metal contaminant in water of Claim 1 further characterized in that said reducing agent is a free metal or metal salt selected from the class consisting of iron and iron salts and cobalt and cobalt salts.

The method for determining a presence of a metal contaminant in water of Claim 1 further characterized in that said reducing agent is a metal or metal salt selected from the class consisting of cerium, cobalt, europium, iron, manganese, nickel, platinum, praseodymium, rhenium, rhodium, samarium, terbium, tin, titanium, and ytterbium.

The method for determining a presence of a metal contaminant in water of Claim 1 further characterized in that said composition comprises a member selected from the class consisting of sequestering agents, flocculating agents and precipitating agents.

The method for determining a presence of a metal contaminant in water of Claim 5 further characterized in that said composition also comprises a dispersing agent.

The method for determining a presence of a metal contaminant in water of Claim 6 further characterized in that said composition is present in the form of a water-soluble tablet capable of being introduced into a sample of water to be tested.

The method for determining a presence of a metal contaminant in water of Claim 1 further characterized in that said change is a visual change in the water.

The method for determining a presence of a metal contaminant in water of Claim 1 further characterized in that said change is a presence of suspended solid matter in the water.

A method for testing for the presence of a potentially harmful multi-valent metal containing contaminant capable of being reduced, said method comprising:

- 5           a) introducing into a sample of the water to be tested  
a composition which will reduce the metal  
contaminant to a lower or reduced valence state and  
concomitantly change the visual appearance of the  
water containing medium based on a potential  
10           presence of the metal contaminant of water.

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The method of testing for the presence of a potentially harmful metal constituent in water of Claim 10 further  
15 characterized in that said method comprises also introducing into the sample of water to be tested a member selected from the class consisting of sequestering agents and flocculating agents.

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20           The method of testing for the presence of a potentially harmful metal constituent in water of Claim 10 further characterized in that said method introducing into the sample of water to be tested a sequestering agent to enable efficient interaction of the constituents in the water and complete reduction  
25 of the metal contaminant.

The method of testing for the presence of a potentially harmful metal constituent in water of Claim 10 further characterized in that said method comprises detecting for the presence of any one of arsenic, chromium and mercury or salts thereof.

The method of testing for the presence of a potentially harmful metal constituent in water of Claim 10 further characterized in that said method comprises adding to said sample of water a metal-containing reducing agent selected from the class consisting of iron and cobalt.

The method of testing for the presence of a potentially harmful metal constituent in water of Claim 10 further characterized in that said method comprises introducing into the sample of water a metal-containing reducing agent selected from the class consisting of cerium, cobalt, europium, iron, manganese, nickel, platinum, praseodymium, rhenium, rhodium, samarium, terbium, tin, titanium, and ytterbium.

A composition making a determination of the presence of a potentially harmful water-soluble, multi-valent and ionically reducible metal contaminant in water, said composition comprising:

- a) a water-soluble multi-valent, metal-containing reducing agent introducible into the water to be tested and which will reduce the metal contaminant to a lower valence state; and
- b) another ingredient which will allow for stabilization of any reaction products, and present indication of these products by a rapid visible change in the water thereby identifying presence of the potentially harmful metal contaminants.

The composition for determining a presence of a metal contaminant in water of Claim 16 further characterized in that said reducing agent is one which will readily reduce the valence state of a metal-containing contaminant selected from the group consisting of arsenic, chromium and mercury or salts thereof.

The composition for determining a presence of a metal contaminant in water of Claim 16 further characterized in that said reducing agent is one which will readily reduce the valence state of the contaminant and is a free metal or metal salt selected from

the class consisting of iron and iron salts and cobalt and cobalt salts.

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5       The composition for determining a presence of a metal  
contaminant in water of Claim 16 further characterized in that said  
reducing agent is a metal or metal salt selected from the class  
consisting of cerium, cobalt, europium, iron, manganese, nickel,  
platinum, praseodymium, rhenium, rhodium, samarium, terbium, tin,  
10   titanium, and ytterbium.

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15       The composition for determining a presence of a metal  
contaminant in water of Claim 16 further characterized in that  
another ingredient comprises a member selected from the class  
consisting of sequestering agents, precipitating agents and  
flocculating agents.

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20       The composition for determining a presence of a metal  
contaminant in water of Claim 20 further characterized in that said  
composition also comprises a dispersing agent.

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25       The composition for determining a presence of a metal  
contaminant in water of Claim 21 further characteriz d in that said

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composition is present in the form of a water-soluble tablet capable of being introduced into a sample of water to be tested.

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5       The method for determining a presence of a metal contaminant in water of Claim 16 further characterized in that said change is a visual change in the water.

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10       The method for determining a presence of a metal contaminant in water of Claim 16 further characterized in that said change is a presence of suspended solid matter in the water.



A tableted composition for detecting the presence of a potentially harmful metal contaminant in water by visual determination when the tableted composition is introduced into the water, said tableted composition comprising:

- a) a reductant capable of reducing the metal contaminant to a reduced state; and
- b) a component selected from the class consisting of a sequestering agent and a stabilizing agent.

The tableted composition of claim 25 further characterized in that said composition comprises a dispersing agent for obtaining rapid mixing and dispersal of the reducing agent throughout the sample of water to be tested.

The tableted composition of Claim 25 further characterized in that said reducing agent is a metal or metal salt selected from the class consisting of ferrous and cobalt metals and metal salts.

The tableted composition of Claim 25 further characterized in that said dispersing agent is sodium bicarbonate.

The tableted composition of Claim 25 further characterized in that said sequestering agent is a dicarboxylic or tricarboxylic acid.

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The tableted composition of Claim 25 further characterized in that said visual determination arises by observation of a suspension of solid matter in water.

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The tableted composition of Claim 25 further characterized in that said metal contaminant is a contaminant which comprises a metal selected from the group consisting of arsenic, chromium and mercury or salts thereof.

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The tableted composition of Claim 25 further characterized in that said reducing agent is a metal or metal salt selected from the class consisting of cerium, cobalt, europium, iron, manganese, nickel, platinum, praseodymium, rhenium, rhodium, samarium, terbium, tin, titanium, and ytterbium.

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A method for eliminating from a body of water a potentially harmful multi-valent water-soluble metal contaminant capable of being reduced to a lower valence state, said method comprising:

- a) introducing into said body of water a composition comprising a water-soluble, multi-valent, metal-containing reducing agent capable of reducing the metal contaminant to a lower valence state;
- b) also introducing into said body of water a flocculating and precipitating ingredient which enables consolidation of the reduced metal contaminant in the body of water; and
- c) removing the reduced metal contaminant from the body of water.

The method for eliminating from a body of water the potentially harmful multi-valent water-soluble contaminant of Claim 33 further characterized in that said method causes precipitation of reduced contaminants in the water and permits removal of the reduced constituents from the body of water.

The method for eliminating from a body of water the potentially harmful multi-valent water-soluble contaminant of Claim 33 further characterized in that said metal contaminant is a

contaminant which comprises a metal selected from the group consisting of arsenic, chromium and mercury or salts thereof.

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5       The method for eliminating from a body of water the  
potentially harmful multi-valent water-soluble contaminant of Claim  
33 further characterized in that said reducing agent is a metal or  
metal salt selected from the class consisting of cerium, cobalt,  
europium, iron, manganese, nickel, platinum, praseodymium, rhenium,  
10 rhodium, samarium, terbium, tin, titanium, and ytterbium.

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      The method for eliminating from a body of water the  
potentially harmful multi-valent water-soluble contaminant of Claim  
15 33 further characterized in that said composition comprises a  
member selected from the class consisting of sequestering agents  
and flocculating and precipitating agents.

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20       The method for eliminating from a body of water the  
potentially harmful multi-valent, water-soluble contaminant of  
Claim 33 further characterized in that said composition also  
comprises a dispersant.

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A reaction system for eliminating from water multi-valent, water-soluble metal contaminants which are reducible in the presence of a selected reducing agent, said system comprising:

- 5       a) a reaction volume containing a body of water to be treated for elimination of said harmful metal constituent; --
- b) means for introducing into said reaction volume a water-soluble, multi-valent metal reducing agent  
10       able to react with and effectively reduce the metal contaminant to a reduced valence state and simultaneously oxidize the reducing agent to a higher oxidized valence state;
- c) means allowing for introduction into the body of  
15       water an ingredient which permits separation of solid constituents formed through reaction of the metal contaminant with the reducing agent; and
- d) means for discharging and removing any separated  
20       solid constituents from the body of water.

The reaction system for eliminating multi-valent metal contaminants from water of Claim 39 further characterized in that said metal contaminant is a contaminant which comprises a metal  
25       selected from the group consisting of arsenic, chromium and mercury or salts thereof.

The reaction system for eliminating multi-valent metal contaminants from water of Claim 39 further characterized in that said reaction volume is contained in a reaction chamber.

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The reaction system for eliminating multi-valent metal contaminants from water of Claim 41 further characterized in that said chamber comprises a window through which to view an indication of the presence of the potentially harmful metal contaminant based on a visual change in a reaction medium therein.

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The reaction system for eliminating multi-valent metal contaminants from water of Claim 39 further characterized in that said reducing agent is a finely divided free metal or metal salt selected from the class consisting of iron and iron salts and cobalt and cobalt salts.

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The reaction system for eliminating multi-valent metal contaminants from water of Claim 39 further characterized in that said reducing agent is a metal or metal salt selected from the class consisting of cerium, cobalt, europium, iron, manganese, nickel, platinum, praseodymium, rhenium, rhodium, samarium, terbium, tin, titanium, and ytterbium.

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The reaction system for eliminating multi-valent metal contaminants from water of Claim 39 further characterized in that said ingredient comprises a member selected from the class  
5 consisting of sequestering agents, precipitating agents and flocculating agents.

The reaction system for eliminating multi-valent metal  
10 contaminants from water of Claim 45 further characterized in that said ingredient also comprises a dispersing agent.

A reaction system for eliminating water-soluble, multi-valent metal contaminants from water which are reducible in the presence of a selected reducing agent, said system comprising:

- 5       a) a reaction volume containing a body of water to be treated for elimination of said harmful metal constituent;
- b) means for introducing into said reaction volume a water-soluble, multi-valent metal reducing agent  
10       able to react with and effectively reduce the metal contaminant to the reduced valence state and simultaneously oxidize the reducing agent to a higher oxidized valence state; *GW*
- c) introducing through said means for introducing a  
15       member selected from the class consisting of sequestering agents and flocculating and precipitating agents to collect any precipitated constituents in the body of water; and
- d) a dispersing agent to enable fairly rapid dispersal  
20       of the reducing agent in the body of water.

The reaction system for eliminating multi-valent metal contaminants from water of Claim 39 further characterized in that  
25   said system comprises a reactor detecting for presence of arsenic, chromium and mercury or salts thereof.



The reaction system for eliminating multi-valent metal contaminants from water of Claim 39 further characterized in that said metal-containing reducing agent is a member selected from the class consisting of iron and cobalt.

The reaction system for eliminating multi-valent metal contaminants from water of Claim 39 further characterized in that said metal-containing reducing agent is a member selected from the class consisting of cerium, cobalt, europium, iron, manganese, nickel, platinum, praseodymium, rhenium, rhodium, samarium, terbium, tin, titanium, and ytterbium.